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The Self-Portrait of a Scientist

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In recent years, memoir has consistently been among the bestselling genres in American publishing. Readers devour tales of drug abuse, incest, depression, and sundry other personal challenges—often too credulously, as the recent rehab fabulations of author James Frey attest. Many of these books tell stories of human weakness and the redemption achieved by the author in overcoming them. In so doing they tap into our longing for narratives of the extraordinary in ordinary life, and for stories that suggest that individual lives do, indeed, matter. This is a significant change from previous eras, which preferred narratives of extraordinary lives; memoirs were then something public figures published toward the end of their lives, and the idea that the musings of a Midwestern drug addict would reach millions of readers would have been preposterous.

Part of the appeal of memoir is its promise to give readers a glimpse into the emotional worlds of other people. "There is a history in all men's lives," Shakespeare wrote in *Henry IV, Part 2*, and while this is true, some histories lend themselves more easily to memoir than others. Memoir is distinct from mere memory; it requires interpretation, the sifting and selection of many memories to present a coherent story, the creation of a whole seen from the limited perspective of a single self.

Memoir might seem a strange genre for the modern scientist who is, by profession, a rationalist student of some particular slice of the objective world. In his *Literary Companion to Science*, Walter Gratzer described scientific memoir as "in general an ineffably boring genre," a not entirely unfair assessment. The tedious and technical day-to-day work of science does not always make for the most gripping reading, nor does it always suit the demand for drama, redemption, and resolution so favored by the contemporary reader. One is far more likely to find these in the memoirs of literary figures than in the reminiscences of mathematicians or physicists.

But in another sense memoir is a good fit for scientists, since their work is, in some ways, about constructing narratives. As Nobel laureate biologist Peter Medawar observed, the work of scientists is "building explanatory structures, telling stories which are scrupulously tested to see if they are stories about real life." And since much of the work of sci-

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entists is esoteric, inscrutable to all but the technically trained, memoirs can make science approachable, giving us autobiographical narratives that can help the rest of us grasp what modern science really is.

The memoirs of scientists can also offer insights into the broader culture of science, and perhaps help answer questions that are deeply important to all of us: How democratic is science? How useful or accurate is it, in the twenty-first century, to understand the scientist as a quasi-heroic figure on a quest for truth and knowledge? What do scientists' memoirs have to teach us about individual loyalties, questions of ethics, and the public's responsibility to hold scientists accountable for the fruits of their labor—particularly if those fruits are bitter? In an age when the products of science, especially new technologies and medical treatments, are so often cited as evidence of our debt to science, how much do we really understand about the men and women practicing it?

A Sense of Wonder

Although scientists have been committing their memoirs to paper for centuries, there seems to be a difference in tone between memoirs written in the twentieth century and those that came before. Earlier memoirs describe a world where science was still largely an amateur activity—literally, one pursued out of love—rather than a profession. In their memoirs, Joseph Priestley, Charles Darwin, and others demonstrate a *sentiment* about science rather than any distinct scientific *personality*. That sentiment was infused with an abiding wonder and fascination with the natural world—not wholly devoid of ambition, of course, but also bounded by a humility that came from their respect for the vast amount that was, and would remain, unknowable. The ambition to be the known discoverer of new truths about nature was concealed, in large measure, in the stylistic modesty of the student, a modesty in tune with the culture of the age. Present, too, was an idealism that perhaps could only be nurtured in an age of amateur science, still filled with a healthy appreciation for the power of chance. Not long before his death in 1727, Isaac Newton touched on this sentiment when he wrote, "I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

The nonconformist Unitarian clergyman Joseph Priestley (1733-1804) demonstrates a similar approach to the natural world in his *Memoirs of Dr. Joseph Priestley*. Priestley's tale is that of a religious man who happens to

enjoy dabbling in science, and most of the text is devoted to his various theological wranglings. As a young man, Priestley had an eclectic education, studying algebra and geometry as well as reading Locke and learning Hebrew and Arabic. His own assessment of his young talents was modest: "For my own part," he wrote, "I can truly say I had very little ambition, except to distinguish myself by my application to the studies proper to my profession." That profession, the ministry, was not always an easy one for him. His pronounced stammer and unorthodox ideas often tried the patience of his congregations and his clerical superiors. (Priestley eventually fled England for the United States after a mob, angry over his views on religion and his support of the French Revolution, attacked his home).

Alongside Priestley's questioning of church doctrine existed a questioning spirit about the natural world. His earliest interest was in electricity, and he maintained a correspondence with Benjamin Franklin on the subject (admitting in his memoir that he was gravely disappointed that Franklin was not a Christian). Priestley published a history of electricity in 1767 that was fairly well received. But it was his move to a parish in Leeds—and the chance of fate that found him living in a house next to a brewery—that piqued his curiosity about the properties of air. A series of experiments eventually yielded what he called "dephlogisticated" air—as opposed to the "fixed air" (carbon dioxide) he found in the brewery—in 1774. (The French chemist Lavoisier would build on Priestley's discovery, naming the new gas oxygen.) Yet even after such a momentous discovery, Priestley was more a man of the cloth than a man of science: his memoir describes a trip to France, where he met with "many unbelievers in Christianity," but neglects to describe the meeting with the French chemists where he explained his discovery.

Although rarely personally or emotionally revelatory (he refers to his wife only as "a daughter of Mr. Isaac Wilkinson, an ironmaster"), Priestley's memoir does provide the reader with a sense of the culture of science at the time. Despite the existence of at least some men dedicated solely to science, the field still welcomed the discoveries of amateurs like Priestley. A small but thriving international community of the scientifically minded existed, with journals and meetings and the other accoutrements of a fledgling profession. But the careful gate-keeping and credentialing and hyper-specialization of later eras had not yet taken firm hold, allowing a dabbler like Priestley to make an important contribution to man's knowledge of nature. One is left, in the end, with an impression of Priestley as a seeker—primarily after spiritual fulfillment and only secondarily after knowledge of God's creation.

The Sentiment of Science

Like Priestley, Charles Darwin (1809-1882) wrote his memoirs toward the end of his life, between the ages of 67 and 73, but his recollections are more thorough and more reflective than Priestley's. *The Autobiography of Charles Darwin* is, as a result, one of the most engaging scientific memoirs ever published, and offers insights into the life of the scientist that Priestley's memoir lacks.

Darwin's memoir is organized as a straightforward chronological telling of his life. Even as a child, he writes, "my taste for natural history, and more especially for collecting, was well developed. I tried to make out the names of plants, and collected all sorts of things, shells, seals, franks, coins, and minerals." As a student he judged himself "a very ordinary boy, rather below the common standard in intellect," and once, after meeting a well-respected philosopher, thought himself "ignorant as a pig" by contrast. He writes that he agreed with his cousin, the eugenicist Francis Galton, that "education and environment produce only a small effect on the minds of any one, and that most of our qualities are innate."

At Cambridge, Darwin's "passion for collecting" continued, focusing mainly on beetles, while his readings in natural philosophy "stirred up in me a burning zeal to add even the most humble contribution to the noble structure of Natural Science." But it was upon his acceptance to join the crew of the *H.M.S. Beagle* in 1831 that Darwin felt his real education began. Like Priestley, he recognized the great role chance played in the process: Robert Fitzroy, the captain of the *Beagle*, evidently disliked the shape of Darwin's nose, and, "convinced that he could judge a man's character by the outline of his features," nearly refused to allow Darwin to join the voyage.

While Darwin's experience aboard the *Beagle* (recounted in full in his journals, *The Voyage of the Beagle*) reaffirmed his passion for collecting, honed his skills of observation, and encouraged his "strong desire to add a few facts to the great mass of facts in natural science," it also nurtured a new ambition: "To take a fair place among scientific men." This was a bounded ambition, however. Looking back on this youthful aspiration from the perch of old age, Darwin reflects that although he cared "in the highest degree" for the attention and approbation of great scientists, "I did not care much about the general public." "I am sure," he wrote, "that I have never turned one inch out of my course to gain fame."

The rest of Darwin's autobiography describes the years leading up to and following the publication of *The Origin of Species*, which he called "no

doubt the chief work of my life." But it also offers glimpses into Darwin's overall sensibility—a certain sentiment about science that was also present, albeit in less dramatic form, in Priestley's work. It is most clear in the language Darwin adopts when reflecting on his choice of occupation: "I believe that I have acted rightly in steadily following and devoting my life to science," he writes. Later, he notes the "pure love" he had for natural science, a love that remained "steady and ardent" throughout his life.

This language of devotion—linked to Darwin's irrepressible desire to see, understand, and categorize—is the central theme of his memoir. Nature writer John Burroughs (1837-1921), describing this sensibility, noted that "such a man as Darwin was full of what we may call the sentiment of science. . . . He is full of the ideal interpretation of fact, science fired with faith and enthusiasm, the fascination of the power and mystery of nature. All his works have a human and almost poetic side." It is this "human and poetic side" that is often missing from the memoirs of Darwin's heirs.

The Language of Mastery

Perhaps the transition from the sentiment of Priestley and Darwin to the modern scientific personality can be traced to the year 1901—the date the first Nobel Prizes in physics, chemistry, and medicine were awarded. The Nobel Prize forever altered scientists' sense of their own work. By promising a concrete, internationally recognized form of immortality, the prize became the barometer for many scientists' ambitions. By setting a standard of scientific achievement, it also set the bar for what was considered appropriate ambition. Young Darwin's eagerness to make a mark on his fellow naturalists would become, in the twentieth century, the scientist's eagerness to leave an impression on history. The prize also made plain a transition that had been underway for some time: the shift from science as an activity often pursued by amateurs like Priestley to science as a profession—and, eventually, to science as a business.

The memoirs of German physicist Max Planck (1858-1947), best known for his work on quantum theory and radiation, for which he was awarded a Nobel in 1918, are representative of this transformation of the scientific sensibility. A creature more of the twentieth century than the nineteenth (his oldest son died fighting in World War I and another son was executed during World War II after taking part in a plot to assassinate Hitler), Planck called his reminiscences *Scientific Autobiography*. Although the first sentence of the book invokes the language of devotion

to describe his decision to pursue science, it is "pure reasoning" more than pure love that guides him. The memoir is far less reflective than Darwin's and is devoted largely to a recounting of Planck's education, his various frustrations finding an academic post, difficult mentors, the work of previous Nobel laureates, and his own single-minded pursuit of recognition for his scientific work.

Planck writes of his youthful desire "to win, somehow, a reputation in the field of science." Throughout Planck's memoir, the language of competition and combativeness, rather than patience and persuasion, appears. "A new scientific truth does not triumph by convincing its opponents and making them see the light," Planck famously writes, "but rather because its opponents eventually die, and a new generation grows up that is familiar with it."

Planck's autobiography also reveals a rather different approach to the natural world than that of Priestley or Darwin. Where Darwin sought understanding and (most of all) order, Planck seeks mastery. (Perhaps, in this sense, Planck recalls the scientific vision of Bacon and Descartes, with real laboratory science catching up to the original modern understanding of what the study of nature was for.) This sensibility is on display not only in his memoirs but also in his lectures. In "The Meaning and Limits of Exact Science," delivered in 1941, Planck noted that "since knowledge always means power, too, with every new insight that Man gains into the forces at work in Nature, he always opens up also a new gateway to an ultimate mastery over them, to the possibility of harnessing these natural forces and making them obey his every command." Man's goal, in this view, is not merely to understand but to understand so that he might control.

Of course, one should not overstate the case. Planck's sensibility does at times recall that of Priestley and Darwin. He occasionally writes of the sense of wonder, so prevalent in childhood, that remains necessary for the scientist, and of the "artistically creative imagination" required for the scientific pioneer. He finds satisfaction in the "knowledge that he has explored the explorable" but also "quietly venerates the inexplorable." Nevertheless, he sees in science greater power than merely enhancing knowledge; he sees it as having the potential to create an entirely new system of values. "Man wants not only knowledge and power," Planck noted. "He wants also a standard, a measure of his actions, a criterion of what is valuable and what is worthless. He wants an ideology and philosophy of life, to assure him of the greatest good on earth—peace of mind. And if religion fails to satisfy his longing," he concluded, "he will seek a substitute in exact science." Left unexplored by Planck, however, are the

many ways that science itself creates longings—longings for control and power over aspects of life that were once considered the sole province of nature, God, or chance.

The Fame of Discovery

Although Planck's autobiography offers some early hints about the mindset of the modern scientific personality, it is the memoir of a young, brash American scientist named James Watson that typifies it. Published in 1968, Watson's *The Double Helix: A Personal Account of the Discovery of the Structure of DNA* announced its perspective from the first sentence of the book's preface: "Here I relate my version of how the structure of DNA was discovered." The signifier "my version" is Watson's way of notifying the reader that what follows is much more subjective memoir than faithful recounting of facts. It also signals Watson's mindset and approach to his scientific work—straightforward, desirous of fame, and unreflective. "The thought that I should write this book has been with me almost from the moment the double helix was found," he confesses.

The Double Helix is a memoir of a particular period in Watson's life: the time he spent at the Cavendish Laboratory in Cambridge, England, in the early 1950s, and the work that he undertook, with British scientist Francis Crick, that eventually led to the discovery of the structure of DNA. It is presented as a gripping tale of competition and discovery, which indeed it was, and Watson rejected an approach that would have required him to leaven his memoir with the knowledge of later experience. "It would fail to convey the spirit of an adventure characterized both by youthful arrogance and by the belief that the truth, once found, would be simple as well as pretty."

Watson's spirit and personality are on display throughout the book—and it is not an altogether flattering self-portrait. His gimlet-eyed judgments of his coworkers, including his own indispensable partner Francis Crick, are often harsh. "I have never seen Francis Crick in a modest mood," Watson writes. "He could not refrain from subsequently telling all who would listen how his clever new idea might set science ahead." Watson describes Crick swanning into the local pub "to tell everyone within hearing distance that we had found the secret of life." Watson is even harder on Rosalind Franklin, whose scientific achievements in the field of X-ray crystallography he only belatedly acknowledged. To Watson, she was merely a "prickly feminist" who should have devoted more attention to her appearance.

Watson also relishes the image of himself as a heroic individual genius, toiling away for the good of mankind rather than one among many minds at work expanding our knowledge of the world. For his fellow scientists (and indeed, for the profession as a whole) he demonstrates an astonishing contempt. "One could not be a successful scientist," he writes, "without realizing that, in contrast to the popular conception supported by newspapers and mothers of scientists, a goodly number of scientists are not only narrow-minded and dull, but also just stupid." Watson clearly had higher ambitions for himself. "It was certainly better to imagine myself becoming famous than maturing into a stifled academic who had never risked a thought," he writes. (Not all the trappings of academia were unwelcome. Over tea and cakes with Crick he muses about "how splendid it would be if I could someday live in the style of a Magdalen don.")

But it is not Watson's healthy ego or cutting judgments that make his memoir so clearly a product of the modern era. It is his outer-directed sensibility—the palpable feeling throughout the book that Watson believes the world is watching and waiting for his momentous discovery. It is this external recognition—rather than the discovery itself—that seems to fuel Watson's ambition. As a result, the language of the laboratory becomes one of heated competition, if not outright war. Watson's main antagonist, the American chemist Linus Pauling, is portrayed as wily and ambitious. "One could never be sure where he would strike next," Watson writes. Pauling "was bound to try for the most important of all scientific prizes. There was no doubt that he was interested. . . . Within a few days after my arrival [at Cambridge], we knew what to do: imitate Linus Pauling and beat him at his own game." In January 1953, when Pauling suggested a possible shape for the DNA molecule that turned out to be wrong, Watson and Crick drank "a toast to the Pauling failure." Their own double-helix shape for DNA turned out to be correct, and they shared a Nobel Prize for the discovery in 1962. (Pauling, though, beat them nonetheless, claiming a Nobel in 1954 for chemistry and another, the peace prize, in 1962, the same year Watson and Crick received their prize.)

Watson ends his memoir with his famous discovery (a later and less satisfying memoir, *God, Genes, and Gamow: After the Double Helix*, picks up the story where *The Double Helix* left off). Yet Watson offers little insight about the meaning of his own work. Perhaps the profound impatience one senses in the young Watson did not allow for such considerations, and the older celebrity seems somehow above (or incapable of) them. Given some of Watson's later enthusiasms—including a disturbing embrace of eugenics through germ-line genetic manipulation—greater reflection might

have been warranted. The fact that *The Double Helix* is the most famous scientific memoir of modern times, an era with no shortage of great scientists, is perhaps revealing about the impoverished inner life of some who seek to master nature, or (alternatively) about the modern culture of the self that captures even hyper-rational scientists in its net of narcissism and gossip.

The Scientific Vision

Despite differences in tone and sensibility, all of these scientific memoirs reflect certain similarities shared by their authors, traits that transcend their cultural and historical differences. Most of the scientists achieved success in their youth—Isaac Newton said that his "prime age for invention" was the "plague years of 1665-1666," when he was in his early twenties, and James Watson is only twenty-five by the end of his first memoir. As various scientists describe, key elements of their personalities are entrenched during childhood—such as Darwin's passion for collecting.

Most of these memoirists also invoke the need for "artistically creative imagination" in science, as Planck put it. They all pay homage to the unique and often difficult struggle—and ensuing euphoria—of scientific discovery. Although he never wrote a proper memoir, Albert Einstein commented on his own process of discovery (his theory of relativity emerged only after eleven years of work) in tones similar to those used by other scientists. "In the light of knowledge attained," he observed, "the happy achievement seems almost a matter of course, and any intelligent student can grasp it without too much trouble. But the years of anxious searching in the dark, with their intense longing, their alternations of confidence and exhaustion, and the final emergence into the light—only those who have experienced it can understand it."

In this sense, the process of scientific discovery resembles the struggle of the artist to translate a vision into concrete form. The single-mindedness and self-confidence necessary to create art can also be witnessed in the dogged pursuit of formula, theory, or structure in the laboratory. In this, a Picasso and a Watson are alike in spirit. Yet the creative process of scientific discovery is in some ways much more restrictive than the process of artistic creation. The scientist pursues a vision that in the end must prove objectively true to be successful, a vision made real by adhering to the experimental processes and methods of the scientific enterprise. Art might be one man's truth, but science must be truthful for all. Yet for all its objectivity, and for all the new powers it confers upon us, science is

always a partial human enterprise. The truths it describes and discovers are never the whole truth about being human.

For most scientists today, the pursuit of exact knowledge involves decades of specialized research, often tedious in the pursuit if exciting in the result. It is not, alas, the stuff of great memoir, so severed has the actual practice of science become from the broader concerns that animated many early scientists—the wonder at life in its fullness, the observable mysteries of the natural world. In the current age, scientists seek personal glory, even as their individual efforts necessarily shrink when viewed against the totality of the world, whose tiny parts alone they can study with authority.